FEDERAL SUPPLY CLASS
6145

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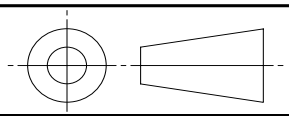
ISSUED 2000-06 REVISED PROPOSED DRAFT 2003-04

THIRD ANGLE PROJECTION



CUSTODIAN: SAE AE-8/AE-8D

SAE Aerospace
An SAE International Group

AEROSPACE STANDARD

WIRE, ELECTRICAL, POLYTETRAFLUOROETHYLENE/ POLYIMIDE INSULATED, NORMAL WEIGHT, TIN COATED, COPPER CONDUCTOR, 150°C, 600 VOLTS

AS22759/88
SHEET 1 OF 8

REV. A

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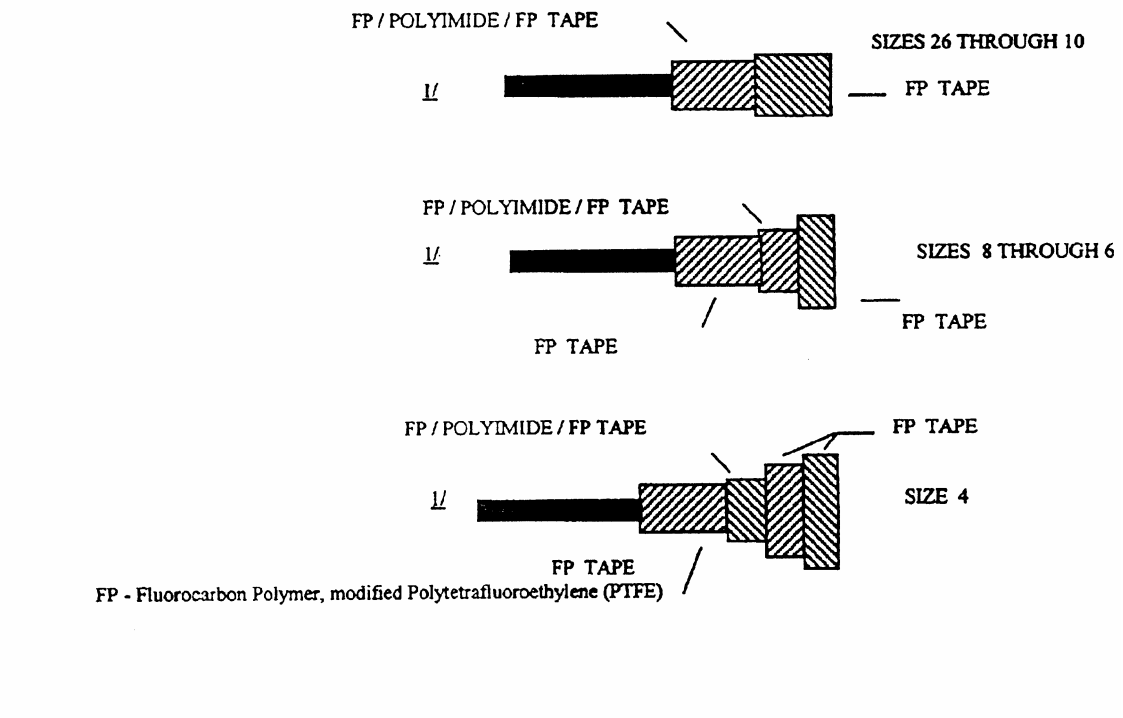
THE REQUIREMENTS FOR ACQUIRING THE PRODUCT DESCRIBED HEREIN SHALL CONSIST OF THIS SPECIFICATION SHEET AND THE ISSUE OF THE FOLLOWING SPECIFICATION LISTED IN THAT ISSUE OF THE DEPARTMENT OF DEFENSE INDEX OF SPECIFICATIONS AND STANDARDS (DODISS) SPECIFIED IN THE SOLICITATION: MIL-W-22759.

REVISION A IS EDITORIAL ONLY, FOR INSERTION OF THE FOLLOWING STATEMENT. "THIS SPECIFICATION IS NOT INTENDED FOR USE IN NAVAL AIRCRAFT OR NAVAL AIR SYSTEMS APPLICATIONS."



1/ Small diameter stranded tin coated copper conductor (sizes 26 to 4)

FIGURE 1. GENERAL CONFIGURATION.

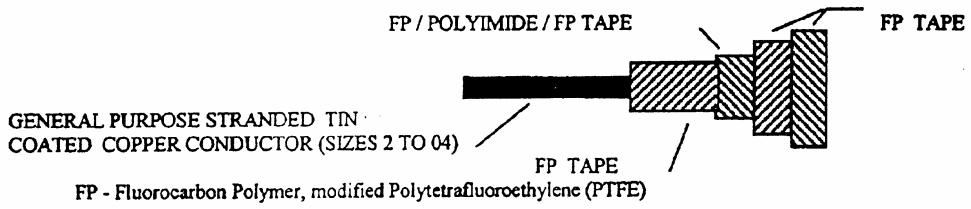


FIGURE 2. GENERAL CONFIGURATION

TABLE I. CONSTRUCTION DETAILS.

Part No. 1/	Wire Size	Conductor			Finished Wire			
		Stranding (number of strands x AWG gauge of strands)	Diameter (in.)		Resistance at 20° C (68°F) (ohms/ 1000 ft max.)	Diameter (in.)		Weight (lb./1000 Ft) (Max.)
			MIN.	MAX.		Min.	Max.	
M22759/88-26-*	26	19 x 38	0.0175	0.0204	41.3	0.033	0.037	1.55
M22759/88-24-*	24	19 x 36	0.0225	0.0244	26.2	0.038	0.042	2.15
M22759/88-22-*	22	19 x 34	0.0285	0.0314	16.2	0.043	0.047	3.00
M22759/88-20-*	20	19 x 32	0.0365	0.0394	9.88	0.051	0.055	4.55
M22759/88-18-*	18	19 x 30	0.0455	0.0494	6.23	0.061	0.065	6.70
M22759/88-16-*	16	19 x 29	0.0515	0.0554	4.81	0.068	0.073	8.60
M22759/88-14-*	14	19 x 27	0.0645	0.0694	3.06	0.081	0.086	12.95
M22759/88-12-*	12	37 x 28	0.0835	0.0894	2.02	0.100	0.105	20.1
M22759/88-10-*	10	37 x 26	0.106	0.112	1.26	0.122	0.127	31.4
M22759/88-8-*	8	133 x 29	0.158	0.169	0.701	0.180	0.188	57.6
M22759/88-6-*	6	133 x 27	0.198	0.212	0.445	0.219	0.229	88.3
M22759/88-4-*	4	133 x 25	0.250	0.268	0.280	0.276	0.288	143.0
M22759/88-2-*	2	665 x 30	0.320	0.340	0.183	0.344	0.364	222.0
M22759/88-1-*	1	817 x 30	0.366	0.380	0.149	0.388	0.408	289.0
M22759/88-01-*	0	1045 x 30	0.395	0.425	0.116	0.420	0.450	345.0
M22759/88-02-*	00	1330 x 30	0.440	0.475	0.091	0.475	0.505	432.0
M22759/88-03-*	000	1665 x 30	0.392	0.540	0.071	0.530	0.560	542.0
M22759/88-04-*	0000	2109 x 30	0.565	0.605	0.056	0.590	0.630	681.0

1/ Part Number: The asterisks in the part number column of Table I shall be replaced by color code designators in accordance with MIL-STD-681. Examples: M22759/88-20-93 is a 20 AWG white with orange stripe.

TABLE II. WIRE INSULATION MATERIALS. 1/

Tape Code	Thickness (Nom)	Material
1	0.0020	0.0005 (FP) / 0.0010 (Polyimide) / 0.0005 (FP)
2	0.0010	FP (Skived)
3	0.0020	FP (Skived)
4	0.0020	FP (Unsintered)
5	0.0025	FP (Unsintered)
6	0.0030	FP (Unsintered)

1/ Physical properties of FP tapes (skived and unsintered) shall be in accordance with MIL-W-22759 requirements.

TABLE III. PHYSICAL PROPERTIES OF FP/POLYIMIDE/FP TAPES.

Tensile Strength	19,000 lb/in sq. (average minimum)
Tensile Modulus	350,000 lb/in sq. (average minimum)
Elongation	40 percent (average minimum)
Dielectric Strength	4,000 volts/mil (average minimum)
0.0005 FP Layer (bottom)	Distinguishable color (next to conductor) May be used at manufacturer's option

TABLE IV. TAPE OVERLAP REQUIREMENTS. 1/

Wire Size	Wrap 1			Wrap 2			Wrap 3			Wrap 4			Nominal Wall Thickness (mils)
	Tape Code	Percent Overlap Min	Max	Tape Code	Percent Overlap Min	Max	Tape Code	Percent Overlap Min	Max	Tape Code	Percent Overlap Min	Max	
26	1	50.5	54.0	4	50.5	54.0							7.4
24	1	50.5	54.0	4	50.5	54.0							7.4
22	1	50.5	54.0	4	50.5	54.0							7.4
20	1	50.5	54.0	4	50.5	54.0							7.4
18	1	50.5	54.0	4	50.5	54.0							7.4
16	1	50.5	54.0	5	50.5	54.0							8.3
14	1	50.5	54.0	5	50.5	54.0							8.3
12	1	50.5	54.0	6	50.5	54.0							9.1
10	1	50.5	54.0	6	50.5	54.0							9.1
8	2	20.5	35.0	1	50.5	55.0	6	67.0	71.0				13.2
6	2	20.5	35.0	1	50.5	55.0	6	67.0	71.0				13.2
4	3	20.5	35.0	1	50.5	55.0	6	50.5	54.0	6	50.5	54.0	16.2
2	3	20.5	35.0	1	50.5	55.0	6	50.5	54.0	6	50.5	54.0	16.2
1	3	20.5	35.0	1	50.5	55.0	6	50.5	54.0	6	50.5	54.0	16.2
1/0	3	20.5	35.0	1	50.5	55.0	6	50.5	54.0	6	50.5	54.0	16.2
2/0	3	20.5	35.0	1	50.5	55.0	6	50.5	54.0	6	50.5	54.0	16.2
3/0	3	20.5	35.0	1	50.5	55.0	6	50.5	54.0	6	50.5	54.0	16.2
4/0	3	20.5	35.0	1	50.5	55.0	6	50.5	54.0	6	50.5	54.0	16.2

1/ Wrap 1 is innermost tape which is in contact with the conductor. Wraps 2, 3, and 4 are progressively further away from the conductor core.

TABLE V. FLUID TABLE.

Test Fluid	Test temperature (°C (°F))	Immersion time (hrs.)
A. MIL-A-8243 Anti - icing and Deicing Defrosting Fluid, undiluted	48 - 50 (118 - 122)	20
B. MIL-A-8243 Anti - icing and Deicing Defrosting Fluid, diluted 60/40 (fluid/water) ratio	48 - 50 (118 - 122)	20
C. MIL-C-43616, Cleaning Compound, Aircraft Surface, Type I	48 - 50 (118 - 122)	20
D. ASTM D1153, Methyl Isobutyl Ketone (For use in Organic Coatings)	20 - 25 (68 - 77)	168
E. SAE AS 1241, Fire Resistant Hydraulic Fluid for Aircraft	48 - 50 (118 - 122)	20
F. MIL-L-7808, Lubricating Oil, Aircraft Turbine Engine, Synthetic Base	118 - 121 (244 - 250)	30
G. MIL-C-87937, Cleaning Compound, Aerospace Equipment, Type II or Type IV, undiluted	63 - 68 (145 - 154)	20
H., MIL-C-87937, Cleaning Compound, Aerospace Equipment, Type II or Type IV, diluted 25/75 (fluid/water) ratio	63 - 68 (145 - 154)	20
I. TT-S-735, Standard Test Fluids: Hydrocarbon, Type I	20 - 25 (68 - 77)	168
J. TT-S-735, Standard Test Fluids: Hydrocarbon, Type II	20 - 25 (68 - 77)	168
K. TT-S-735, Standard Test Fluids: Hydrocarbon, Type IV	20 - 25 (68 - 77)	168
L. Dielectric - coolant Fluid Synthetic Silicate Ester Base, Monsanto Coolanol 25 or approved equivalent.	20 - 25 (68 - 77)	168
M. MIL-G-3056, Gasoline, Automotive , Combat	20 - 25 (68 - 77)	168

RATINGS:

TEMPERATURE RATING: 150°C (302°F) MAXIMUM CONTINUOUS CONDUCTOR TEMPERATURE.
VOLTAGE RATING: 600 VOLTS (RMS.) AT SEA LEVEL

ADDITIONAL REQUIREMENTS:

WET ARC PROPAGATION RESISTANCE (TEST REQUIRED FOR INITIAL QUALIFICATION ONLY): TEST IN ACCORDANCE WITH MIL-STD-2223 METHOD 3006. MEASURE THE DAMAGE OF THE BUNDLE ALONG THE AXIS. THE WIRE IS ACCEPTABLE IF THE FOLLOWING CRITERIA ARE MET:

1. A MINIMUM OF 67 WIRES PASS THE DIELECTRIC TEST.
2. THREE WIRES OR LESS FAIL THE DIELECTRIC TEST IN ANY ONE BUNDLE.
3. ACTUAL DAMAGE TO THE WIRE IS NOT MORE THAN 3 INCHES IN ANY TEST BUNDLE.

DRY ARC PROPAGATION RESISTANCE (TEST REQUIRED FOR INITIAL QUALIFICATION ONLY): TEST IN ACCORDANCE WITH MIL-STD-2223 METHOD 3007. MEASURE THE DAMAGE OF THE BUNDLE ALONG THE AXIS. THE WIRE IS ACCEPTABLE IF THE FOLLOWING CRITERIA ARE MET:

1. A MINIMUM OF 67 WIRES PASS THE DIELECTRIC TEST.
2. THREE WIRES OR LESS FAIL THE DIELECTRIC TEST IN ANY ONE BUNDLE.
3. ACTUAL DAMAGE TO THE WIRE IS NOT MORE THAN 3 INCHES IN ANY TEST BUNDLE.

BLOCKING: 200°C ± 2°C (392°F ± 3.6°F)

COLOR: IN ACCORDANCE WITH MIL-STD-104, CLASS 1; EXCEPT AS NOTE BELOW. WHITE PREFERRED. CONFORMITY OF COLOR TO THE LIMITS OF MIL-STD-104 SHALL NOT BE REQUIRED AFTER OVEN EXPOSURE.

Munsell color limits for UV laser markable wire

Color	Hue		Value		Chroma	
	From	To	From	To	From	To
Black	2.5RN	2.5RN	7	8.5	N/A	N/A
Blue	5PB	7.5B	7	8	4	6
Green	2.5G	7.5G	7	9	2	6
Red	10RP	5R	7	8	4	6
Yellow	5Y	10Y	8	9	4	6
Brown	2.5YR	7.5R	7	9	2	4
Orange	10R	2.5YR	6	7	8	10
Violet	2.5P	7.5R	7	8	4	8
Gray	Same as Black		Same as Black		Same as Black	

COLOR STRIPING OR BANDING DURABILITY: 125 CYCLES (250 STROKES), 250 GRAMS WEIGHT

CONDUCTOR STRAND ADHESION: REQUIRED

CONTINUOUS LENGTHS: SCHEDULE B

DYNAMIC CUT-THROUGH (TEST REQUIRED FOR INITIAL QUALIFICATION ONLY): TEST IN ACCORDANCE WITH ASTM D 3032, SECTION 22. BLADE SHALL BE THE STANDARD CUTTING BLADE EXCEPT THE CUTTING EDGE RADIUS SHALL BE 0.005 ± 0.001 INCH. MINIMUM AVERAGE DYNAMIC CUT-THROUGH (LBS) SHALL BE AS FOLLOWS:

Wire Size	23 ± 5°C	150 ± 5°C
26	10 lbs.	8 lbs.
20	25 lbs.	20 lbs.
16	25 lbs.	20 lbs.

FLAMMABILITY: TEST IN ACCORDANCE WITH MIL-STD-2223, METHOD 1006, PROCEDURE A.
REQUIREMENTS:
DURATION OF AFTER-FLAME 3 SECONDS (MAX)
FLAME TRAVEL 3.0 INCHES (MAX)
NO FLAMING OF TISSUE

FORCED HYDROLYSIS: (TEST REQUIRED FOR INITIAL QUALIFICATION ONLY) 2000 HOURS AT 70°C. TEST 5 SAMPLES OF AWG SIZE 20 ONLY IN ACCORDANCE WITH SAE AS4373 METHOD 602. ALL 5 SAMPLES MUST PASS THE DIELECTRIC TEST AS LISTED IN METHOD 602.

HIGH FREQUENCY SPARK TEST: (WHEN USED IN LIEU OF IMPULSE DIELECTRIC TEST) TEST IN ACCORDANCE WITH MIL-STD-2223 METHOD 3008, 5.7 KILOVOLTS (RMS.) TEST 100 PERCENT OF THE WIRE.

HUMIDITY RESISTANCE: AFTER HUMIDITY EXPOSURE WIRE SHALL MEET THE REQUIREMENTS FOR INITIAL INSULATION RESISTANCE.

IDENTIFICATION OF PRODUCT: NOT REQUIRED FOR SIZE 26. COLOR CODE DESIGNATOR NOT REQUIRED.

IDENTIFICATION DURABILITY: 125 CYCLES (250 STROKES), 250 GRAMS WEIGHT.

IMMERSION (TEST REQUIRED FOR INITIAL QUALIFICATION ONLY): TEST IN ACCORDANCE WITH MIL-STD-2223 METHOD 1001 INCLUDING THE ADDITIONAL FLUIDS LISTED IN TABLE V OF THIS SPECIFICATION. USE MANDRELS AND WEIGHTS LISTED IN TABLE VI FOR BEND TESTING. DIELECTRIC TEST, 2500 VOLTS (RMS), 60 HZ. FOR TURBINE FUEL IMMERSION TEST OF MIL-STD-2223, EITHER JP4 OR MIL-T-83133 TYPE JP-8 (NATO TYPE F-34) MAY BE USED.

IMPULSE DIELECTRIC TEST: 8.0 KILOVOLTS (PEAK). TEST 100 PERCENT OF THE WIRE

INSULATION RESISTANCE: 5000 MEGOHMS FOR 1000 FEET (MIN.)

INSULATION STATE OF SINTER: (TEST REQUIRED FOR INITIAL QUALIFICATION ONLY) EVALUATE FP LAYERS WITH A DIFFERENTIAL SCANNING CALORIMETER PER ASTM D 4591. APPLICABLE TO 10 AWG AND SMALLER.

	Energy to Melt (Joules/gram)
First Heat	Less than 25 J/g

LIFE CYCLE: 500 HOURS AT 230°C ± 2°C (446°F ± 3.6°F). DIELECTRIC TEST, 2500 VOLTS (RMS), 60 HZ. USE MANDRELS COATED WITH POLYTETRAFLUOROETHYLENE SUCH THAT THE DIAMETER OF THE MANDRELS, AFTER COATING, STILL CONFORM TO THE REQUIRED TEST MANDRELS DIAMETERS OF TABLE VI. AFTER OVEN EXPOSURE, LAYERS SHALL NOT SEPARATE AND OR TAPES SHALL NOT LIFT ALONG THE INSULATION OR AT THE ENDS. (DARKENING OF THE TIN COATING OF THE CONDUCTORS DUE TO THE NORMAL AIR OXIDATION SHALL NOT BE CAUSE FOR REJECTION OF THIS TEST).

LOW TEMPERATURE (COLD BEND): USE MANDRELS AND WEIGHTS SPECIFIED IN TABLE VI. CHAMBER TEMPERATURE, -65°C ± 2°C (-85°F ± 3.6°F). DIELECTRIC TEST, 2500 VOLTS (RMS), 60 HZ.

SHRINKAGE: TEST AT 230°C ± 2°C (446°F ± 3.6°F). MAXIMUM CHANGE IN MEASUREMENT 26 - 10 AWG 0.091 INCH. 8 - 04 AWG 0.125 INCH.

SMOKE: 200°C ± 5°C (392°F ± 9°F); NO VISIBLE SMOKE.

SOLDERABILITY: NOT REQUIRED. THIS SLASH SHEET IS PRIMARILY INTENDED FOR CRIMP TERMINATIONS. FOR SOLDERABILITY APPLICATIONS USE THE SILVER COATED COPPER VERSION OF THIS SPECIFICATION.

STRIPPABILITY: (GROUP II QUALITY CONFORMANCE TEST). TEST SIZE 26 - 14 WIRE ONLY IN ACCORDANCE WITH ASTM D3032 SECTION 27. THE LENGTH OF THE INSULATION SLUGS SHALL BE 0.25 INCHES. STRIP FORCES SHALL BE AS FOLLOWS. THERE SHALL BE NO EVIDENCE OF INSULATION LEFT ON THE CONDUCTOR WHEN VIEWED WITH THE NAKED EYE.

Wire Size	Min. Force	Max. Force
26-20	0.25 lbs.	6.0 lbs.
18-14	0.50 lbs.	7.0 lbs.

TAPE OVERLAP: IN ACCORDANCE WITH MIL-STD-2223, METHOD 6005.

TENSILE MODULUS: TEST COMPOSITE FILM IN ACCORDANCE WITH ASTM D 882, METHOD A

THERMAL INDEX: 150°C (302°F) MINIMUM FOR 10,000 HOURS (TEST REQUIRED FOR INITIAL QUALIFICATION ONLY). TEST SIZE 20 ONLY IN ACCORDANCE WITH ASTM D 3032, SECTION 14.

THERMAL SHOCK RESISTANCE: OVEN TEMPERATURE, 200°C ± 2°C (392°F ± 3.6°F), MAXIMUM CHANGE IN MEASUREMENT, 26 - 10 AWG 0.091 INCH. 8 - 04 AWG 0.125 INCH. NO CRACKING.

UV LASER MARKING: (TEST REQUIRED FOR INITIAL QUALIFICATION ONLY) FP MATERIALS SHALL BE FORMULATED IN SUCH A MANNER TO ACHIEVE A 62% MINIMUM CONTRAST LEVEL WHEN MARKED BY AN ULTRAVIOLET (UV) LASER SOURCE OPERATING AT A DELIVERED POWER NOT TO EXCEED 1.5 JOULES/CM^2. THE CONTRAST LEVEL IS DEFINED AS

$$CL = \frac{\text{(Reflectance of the background insulation - Reflectance of the laser mark)}}{\text{Reflectance of the background insulation}} \times 100$$

WRAP (MANDREL WRAP): NO CRACKING, NO DIELECTRIC BREAKDOWN. USE MANDRELS SPECIFIED IN TABLE VI. DIELECTRIC TEST, 2500 VOLTS (RMS), 60 HZ.

TABLE VI. TEST MANDREL AND TEST LOAD REQUIREMENTS.

Wire Size (AWG)	Test Mandrel Diameter 1/ (inches)			Test Load 1/ (lbs)	
	Cold Bend	Life Cycle/ Bend Test	Wrap	Cold Bend	Life Cycle/ Bend Test
26	1.00	0.375	0.125	3.00	0.50
24	1.00	0.392	0.125	3.00	0.75
22	1.00	0.392	0.125	4.00	1.00
20	1.00	0.392	0.125	4.00	1.50
18	1.50	0.750	0.250	5.00	2.00
16	1.50	1.00	0.250	5.00	2.00
14	2.00	1.00	0.375	5.00	3.00
12	2.00	1.50	0.375	5.00	3.00
10	3.00	2.00	0.375	6.00	3.00
8	4.00	3.00	0.75	10.00	4.00
6	5.00	4.00	1.00	10.00	4.00
4	6.00	5.00	1.25	15.00	4.50
2	8.00	6.00	2.00	15.00	6.00
1	10.00	8.00	2.50	15.00	6.00
0	10.00	8.00	3.00	15.00	6.00
00	12.00	10.00	4.00	20.00	8.00
000	18.00	10.00	5.00	30.00	10.00
0000	18.00	10.00	6.00	30.00	10.00

1/ Tolerance shall be ± 3 percent of the given values.

QUALIFICATION OF WIRE:

FOR QUALIFICATION, A SOURCE IS REQUIRED TO SUBMIT DATA ON QUALITY CONFORMANCE TESTS AND ANY FINISHED WIRE TESTS AS REQUIRED BY THE QUALIFICATION AUTHORIZATION LETTER. ALL OTHER TESTING WILL BE PERFORMED BY THE QUALIFYING ACTIVITY AT THE SOURCE'S EXPENSE.

DUE TO THE EXTENDED TIME PERIOD OVER WHICH THE THERMAL INDEX TEST IS PERFORMED, A SOURCE MAY BECOME QUALIFIED UNDER THIS SPECIFICATION SHEET WHILE THIS TEST IS STILL IN PROGRESS.